

**Unnamed Tributary of Rowan Ditch (Jasper County)  
Low Dissolved Oxygen and Impaired Biotic Community  
Source Identification Study**

**September 2000**



**Surveys Section  
Assessment Branch  
Office of Water Quality  
Indiana Department of Environmental Management  
Indianapolis, Indiana  
IDEM 032/02/072/2003**



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Source Identification Study**

**By**

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Office of Water Quality  
Indiana Department of Environmental Management  
Indianapolis, Indiana  
IDEM 032/02/072/2003  
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**Cover Photo** - Taken from atop culvert, facing upstream towards sampling site UMI020-0003.

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## **Abstract**

The subject of this study is an Unnamed Tributary of Rowan Ditch, a small headwater agricultural ditch in Jasper County. This Ditch was found to have serious water quality and fish community impairments during probabilistic sampling in the summer of 1999. A follow up Source Identification study was conducted in September of 2000 in order to ascertain the cause and sources of impairments effecting this stream. Findings from this study indicate the stream flows through an area characterized by intensive row crop farming activity and is particularly susceptible to nutrient runoff, especially from the north where the riparian buffer is minimal. This condition, along with a small culvert dam downstream of the study sampling site, combine to create an ideal environment for algae and duckweed growth in what is essentially a ponded situation. Without a way for the stream to cleanse itself through the normal flushing dynamics of gradient and re-aeration, anoxic conditions develop. The initial algae proliferation followed by 100% duckweed cover effectively shut down photosynthetic activity and cause subsequent algal die off. This process results in depressed D.O. levels and a very poor fish community.



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## **Introduction**

The Unnamed Tributary of Rowan Ditch (hereafter referred to as Tributary of Rowan Ditch) is a headwater stream beginning at a point near the Louisville and Nashville Railroad tracks southeast of Fair Oaks in Jasper County. This stream travels generally southeast and then east for a distance of 2.08 miles to a confluence with Rowan Ditch which in turn flows south a distance of 1.3 miles to a confluence with the Iroquois River. The Tributary of Rowan Ditch is classified as an intermittent stream for its entire reach on the United States Geologic Survey (USGS) 1:24,000 scale topographic map. Other than immediate riparian zones, land usage within the drainage area of this tributary is almost exclusively agricultural row crop activity.

### **1999 Watershed Survey**

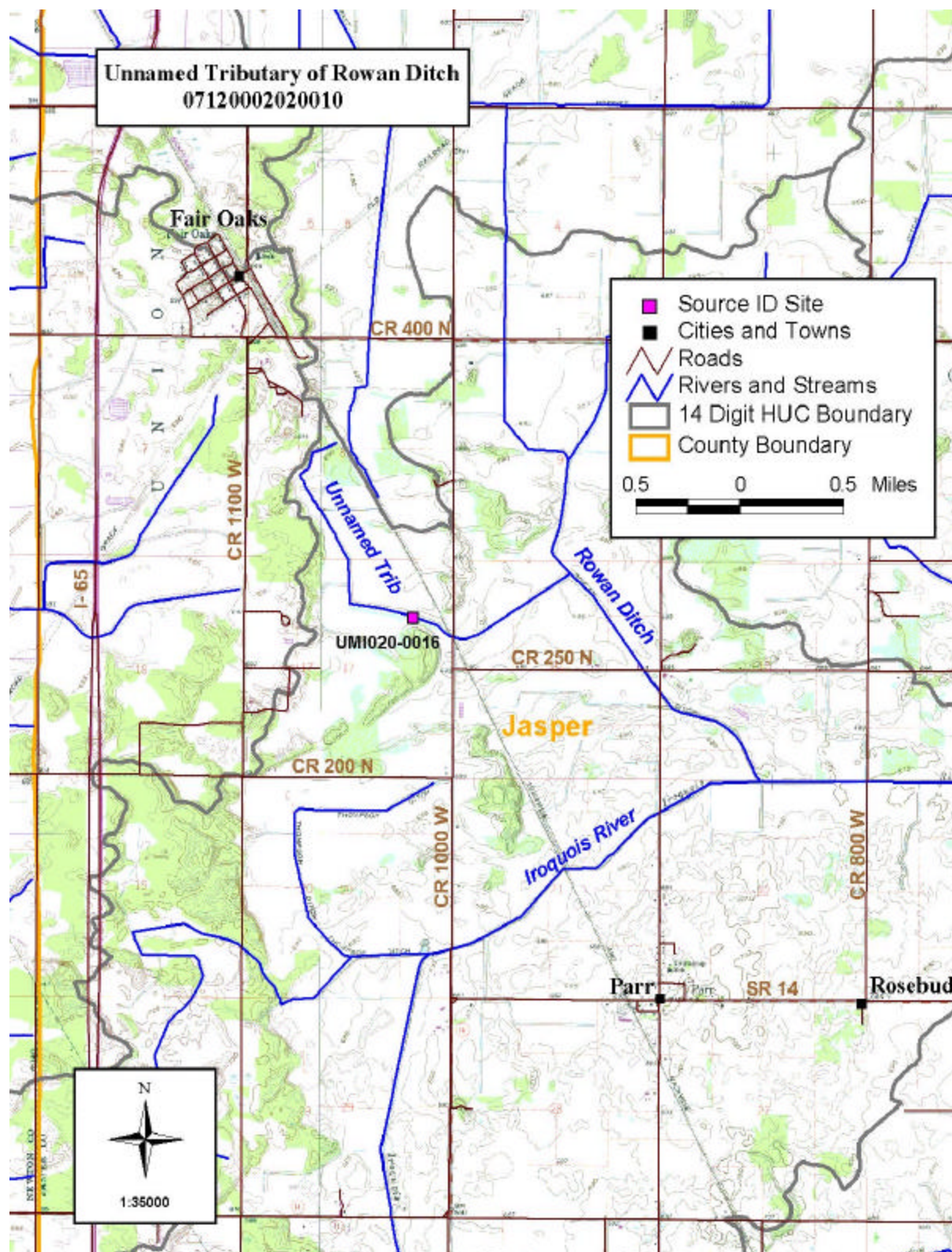
The Tributary of Rowan Ditch was sampled as part of the Assessment Branch Probabilistic Monitoring Program during the field season of 1999 (IDEM 1998a, 1998b). The randomly selected site UMI020-0016 was located at approximately the half way point of the total stream reach of the tributary (Figure 1). This site was sampled three times during the spring to fall sampling season of that year for water chemistry and once for biological data. The water chemistry sampling times were 10:00 AM on June 2<sup>nd</sup>, 9:37 AM on July 13<sup>th</sup>, and 9:35 AM September 9<sup>th</sup>. Field observations for dissolved oxygen (D.O.) indicated extremely low levels for all three sampling events. Levels found were 4.0 mg/L, 0.25 mg/L, and 0.5 mg/L, in the respective order of sampling or an average of 1.58 mg/L for all three sampling events combined. The 4.0 mg/L concentration is considered barely acceptable and the latter two concentrations are considered violations of the Indiana Stream Standard at 327 IAC 2-1-6 (IDEM 2000), which states that concentrations of dissolved oxygen shall not be less than 4.0 mg/L at any time.

Biological Sampling was conducted in conjunction with the second water chemistry sampling event on July 13<sup>th</sup> of 1999. The Index of Biological Integrity (IBI) scored a 28 which is less than the cutoff score of 35 which is considered as the acceptable level for aquatic life use support (ALUS). Refer to Fish Community Assessments included as Attachment I for details of these findings. The fish community assessment showed that a total of only 29 individuals were collected and, of these, 79% were classified as tolerant taxa. There were no sensitive species collected at this site. Headwater taxa were also absent at this location which resulted in a very poor Fish Community Metric Score of 1 (Simon 1999). One of the individuals was observed to have lesions and another was observed with deformities. Due to the low number of individuals collected, these two fish constituted 6.9% of the population. Generally, those species with deformities, eroded fins, lesions, or tumors (DELTS) should represent less than 1% of the population (Simon 1999).

### **2000 Source ID**

The chemical and biological findings from the 1999 Probabilistic Sampling Program made the Tributary of Rowan Ditch a candidate for a Source ID study during the summer of 2000. A study design that incorporated physical and chemical data collection was developed to determine the sources of impairments to this headwater stream. Particular attention was given to dissolved oxygen and land use influences which were deemed critical for this study. The study was to be undertaken in warm weather low flow conditions of late summer in order to collect data during a period when stressor conditions are most acute.

**Figure 1 Map of Survey Area**



## Materials and Methods

The Tributary of Rowan Ditch Source ID study was conducted on September 19<sup>th</sup> and 20<sup>th</sup> of 2000. Weather conditions ranged from scattered clouds and ambient daytime air temperatures of 76 F° to 85 F° on the 19<sup>th</sup> to showers and ambient daytime air temperatures of 61 F° to 75 F° on the 20<sup>th</sup>. The water conditions were relatively stable at the beginning of the study with no precipitation events occurring in the days immediately prior to the sampling event.

### Study Area

Pre-survey of the Tributary of Rowan Ditch indicated a short impacted reach with only one reasonable access point located near the 1999 Probabilistic Site. Considering land usage was consistent throughout the upstream stream reach, the Probabilistic Site was the only site sampled for the 2000 Source ID study. Site UMI020-0016 is located at 41° 03' 09" Latitude and 87° 14' 29" Longitude and approximately one mile downstream from the point of origin of the stream.

### Chemical Measurements

Field and water chemistry data were collected to characterize the nature of problems existent in the Tributary of Rowan Ditch. Field data was collected manually by means of a Hydrolab on both the 19<sup>th</sup> and 20<sup>th</sup> in addition to the use of a datasonde, a programmable multiparameter collection device, that was used to collect data every thirty minutes over the two day sampling period. This instrument is especially helpful in determining diurnal fluctuations over extended periods of time. The water chemistry sample was collected as a grab sample at the end of sampling period when the datasonde was removed from the stream. Field and laboratory parameters analyzed can be found in Tables 1 and 2. Sampling procedures followed standard operating protocol for the Surveys Section (IDEM 2002a).

**Table 1 Field Parameters**

Parameter	Method	Accuracy
Dissolved Oxygen	SM 4500-OG	+/- 0.2 mg/L
Turbidity	SM 2130 <sup>(1)</sup>	+/- 5% of range
Specific Conductance	SM 2510	+/- 1% of range
Temperature	SM 2550	+/- 0.15° Celsius
pH	SM 4500-H	+/- 0.01 SU

<sup>(1)</sup>Or SM 2130 modified method utilizing a light emitting diode sensor

**Table 2 Chemical Parameters for Laboratory Analysis**

Anions/Physical			Nutrients/Organic		
Parameter	Method	MRL <sup>(1)</sup>	Parameter	Method	MRL
Alkalinity	310.1	10 mg/L	TKN	351.2	0.10 mg/L
CBOD <sub>5</sub>	405.1	5.0 mg/L	Ammonia-N	350.1	0.10 mg/L
Total Solids	160.3	7.0 mg/L	Nitrate+Nitrite-N	353.2	0.01 mg/L
Suspended Solids	160.2	4.0 mg/L	Total Phosphorus	356.2	0.03 mg/L
Dissolved Solids	160.1	10 mg/L	TOC	415.1	1.0 mg/L
Sulfate	375.2	5.0 mg/L	COD	410.4	5.0 mg/L
Chloride	325.2	1.0 mg/L			
Hardness	130.1	1.0 mg/L			

<sup>(1)</sup> Method/Laboratory Reporting Limit

## **Physical Characteristics and Measurements**

Physical stream measurements were also important components used in evaluating stream conditions in the Tributary of Rowan Ditch. Flow measurements, gradient calculations, and physical stream descriptions were collected to further evaluate the impaired conditions in this headwater stream.

## **Quality Assurance**

Contracted laboratories provided analytical reports to IDEM that contained test results and Quality Control information for each batch of samples. Quality assurance and quality control (QA/QC) procedures for this study adhered to the Quality Assurance Project Plan (QAPP) and all field and laboratory data collected for this study met QA/QC requirements for Indiana Surface Water Quality Monitoring Programs of the Assessment Branch (IDEM 1999). See Attachment I for a complete copy of the report pertaining to this study. Generally, this plan requires one duplicate and one matrix spike/matrix spike duplicate (MS/MSD) for every ten samples collected in addition to one blank sample for every field trip. Note that this one sample study was conducted in tandem with another small study to optimize resources and QA/QC requirements. Stream samples and field data are also required to meet Data Quality Assessment levels cited in the QAPP for Indiana Surface Water Quality Programs. Data quality assessment levels can also be found by referral to the Quality Assurance Project Plans in Attachment I.

## **Results and Discussion**

### **Stream Assessment**

The Tributary of Rowan Ditch is a headwater ditch situated in an agricultural area that is devoted to row crop production. Physical observations indicated the stream was devoid of any sinuosity and had obviously been channelized. The south bank riparian zone was very steep and tree lined. The north bank was also very steep and grass lined, however row crop activity encroached on the brim of the bank and afforded very little buffer zone.

Water and stream conditions at the time of the survey were not indicative of a healthy ecosystem. The water surface was completely covered with duckweed that effectively shut off sunlight penetration to the stream. By skimming the duckweed aside, the water appeared very murky and dark, and was choked with decaying algae that had proliferated before the onset of the duckweed growth. Wading was very difficult due to the deep black mucky sediment that had formed at least in part from decaying vegetation. Black sediment clouds roiled to the surface with each wading step and released a smell similar to rotten eggs. Velocity and flow measurements were not practical due to the mucky sediment, algae choked conditions, and duckweed. Visual observation of the water revealed quiescent conditions and absolutely no visually discernable water movement. The Tributary of Rowan Ditch had more the appearance of an elongated pond than a flowing stream.

The most important physical observation with direct bearing upon the adverse stream conditions was found approximately one hundred yards downstream of the sampling site. A culvert underneath a farm access lane had been mostly boarded up which was effectively serving as a dam for this small agricultural ditch. This dam had created a reservoir and the stagnant stream conditions. There was no evidence of irrigation equipment or irrigation being conducted at the

time of the study. Stream gradient and re-aeration capabilities had effectively been eliminated. Essentially, cropland runoff and the culvert dam had setup an ideal environment for the algal and duckweed growth to proliferate without the usual flushing and re-aeration activity in this stream which normally would have had a 5.28 ft/mi gradient.

Field and laboratory data collected for this study contributed further evidence to degraded conditions in the Tributary of Rowan Ditch. See Tables 3, 4, and 5 for presentation of all data values collected for site UMI020-0016 during the present study.

**Table 3 Field Data for Site UMI020-0016 on Tributary to Rowan Ditch**

Date	Time	D.O. ( mg/L)	pH (SU)	Temp (°C)	Spec. Con. (umhos/cm)	Turbidity (NTU)
9/19/00	16:35	0.84	6.82	17.54	782	14.5
9/20/00	14.55	1.16	7.18	15.47	746	42

**Table 4 Laboratory Analysis Results for Site UMI020-0016 on Tributary to Rowan Ditch**

Parameter	Result	Parameter	Result
Alkalinity	160 mg/L	Total Phosphorus	0.19 mg/L
Chloride	79 mg/L	Total Dissolved Solids	460 mg/L
Chemical Oxygen Demand (COD)	48 mg/L	Suspended Solids	6 mg/L
Hardness (as CaCO <sub>3</sub> )	N/A	Total Solids	460 mg/L
Ammonia	0.59 mg/L	Sulfate	38 mg/L
Total Kjeldahl Nitrogen	2.6 mg/L	Total Organic Carbon	12 mg/L
Nitrate+Nitrite, Nitrogen	9.7 mg/L	Biochemical Oxygen Demand	19 mg/L

N/A – not available

### Dissolved Oxygen

Evaluation of the stream data indicates severely depressed D.O. levels throughout the study period. Diurnal fluctuation was not an issue in this study since the levels were consistently extremely low. This is particularly evident by examining the D.O. values from the datasonde monitoring results displayed in Table 5. The maximum value observed was 0.65 mg/L, taken during the initial data byte at 5:00 PM on September 19<sup>th</sup>. The D.O. values progressively decrease over the period of time that the datasonde was deployed to a low of 0.25 mg/L at 3:00 PM on September 20<sup>th</sup>. This gradual decrease might be explained by the murky and turbid conditions that could have progressively inhibited membrane reactivity due to fouling during the survey period. Comparison of the manually collected Hydrolab D.O. with the electronically recorded datasonde D.O. shows close correlation at the beginning of the study. The Hydrolab indicated a reading of 0.84 mg/L at 4:35 PM as compared to 0.65 mg/L by the datasonde at 5:00 PM. This is a reasonable comparison considering the values were taken 25 minutes apart. The ending survey values however, were 1.16 mg/L for the Hydrolab as compared to the 0.25 mg/L reading for the datasonde. These readings were only five minutes apart and lend evidence to the occurrence of membrane fouling that degraded the ability of the probe to correctly measure D.O. concentrations. Regardless of the difference in readings at the end of datasonde deployment, observation of the initial datasonde D.O. and of the manually collected Hydrolab readings support the finding that the D.O. levels in the Tributary of Rowan Ditch were extremely depressed during the survey and did not meet stream standards.

**Table 5 Datasonde Data for Site UMI020-0016 on Tributary to Rowan Ditch**

Date/Time	Temp (°C)	D.O. (mg/L)	D.O. (% Sat)	pH (SU)	Spec. Cond. (mS/cm)
9/19/00					
17:00	14.35	0.65	6.6	7.32	795
17:30	14.30	0.59	5.9	7.26	793
18:00	14.32	0.54	5.5	7.23	790
18:30	14.33	0.54	5.4	7.21	791
19:00	14.35	0.52	5.2	7.20	790
19:30	14.35	0.47	4.8	7.19	789
20:00	14.38	0.46	4.7	7.19	791
20:30	14.38	0.47	4.7	7.19	789
21:00	14.43	0.46	4.6	7.19	788
21:30	14.43	0.46	4.6	7.19	791
22:00	14.45	0.44	4.5	7.19	791
22:30	14.50	0.45	4.6	7.18	789
23:00	14.50	0.43	4.3	7.18	791
23:30	14.53	0.40	4.0	7.18	790
9/20/00					
00:00	14.54	0.39	4.0	7.18	790
00:30	14.59	0.40	4.0	7.18	788
01:00	14.62	0.40	4.1	7.18	789
01:30	14.62	0.39	3.9	7.17	789
02:00	14.63	0.38	3.9	7.17	788
02:30	14.66	0.37	3.7	7.17	788
03:00	14.68	0.35	3.5	7.16	787
03:30	14.69	0.35	3.6	7.16	786
04:00	14.68	0.34	3.4	7.17	786
04:30	14.76	0.36	3.7	7.16	784
05:00	14.77	0.35	3.6	7.16	784
05:30	14.77	0.34	3.4	7.16	784
06:00	14.80	0.32	3.3	7.16	783
06:30	14.80	0.32	3.2	7.16	783
07:00	14.82	0.33	3.4	7.16	782
07:30	14.84	0.29	3.0	7.15	782
08:00	14.85	0.31	3.1	7.15	781
08:30	14.86	0.29	2.9	7.15	782
09:00	14.86	0.28	2.8	7.15	781
09:30	14.87	0.30	3.0	7.15	781
10:00	14.88	0.30	3.0	7.15	783
10:30	14.89	0.31	3.1	7.15	782
11:00	14.88	0.30	3.0	7.15	785
11:30	14.91	0.28	2.9	7.15	784
12:00	14.91	0.27	2.7	7.15	786
12:30	14.93	0.28	2.8	7.15	787
13:00	14.93	0.29	3.0	7.15	786
13:30	14.95	0.27	2.7	7.15	784
14:00	14.93	0.25	2.5	7.15	785
14:30	14.87	0.26	2.7	7.15	794
15:00	14.94	0.25	2.6	7.15	787

## Chemical Oxygen Demand

Of special interest with impairment implications in the 1999 Probabilistic Study as well as in the current study was the finding of apparently elevated chemical oxygen demand (COD) values. As a means of comparative analysis, ambient COD concentrations from the Surveys Section Statewide Fixed Station Monitoring Program were examined for sampling years 1991 through 2002. The data set, which included 15,004 tests for COD, showed a mean of 17.8 mg/L and maximum of 390 mg/L. These values compare to the Tributary of Rowan Ditch probabilistic sampling event mean of 57.3 mg/L (individual results, 21 mg/L, 97 mg/L, and 54 mg/L)<sup>1</sup>.

Of the 15,004 COD tests, only six in the eleven-year period were above the 97 mg/L maximum observed in the Tributary of Rowan Ditch. COD measures the oxygen equivalent of organic matter in a sample that is sensitive to a strong oxidizing agent (Csuros 1994). Csuros also notes that COD can be related empirically to biochemical oxygen demand (BOD). As noted above, oxygen levels were severely depressed at site UMI020-0016 and, in all likelihood, COD played a role in the oxygen demand for the stream.

In the present study, laboratory analysis also showed COD and BOD values that were much higher than those values normally obtained by the Surveys Section Fixed Station Program. COD was measured at 48 mg/L (Table 4), significantly higher than the Fixed Station data set mean of 17.8 mg/L described in the preceding paragraph. The BOD value of 19 mg/L (Table 4), was also significantly higher than the mean of 1.5 mg/L for 6,699 tests in the Fixed Station data set. The elevated concentration measured for these parameters are indicative of conditions that add to the oxygen demand in the Tributary of Rowan Ditch.

Evaluation of other chemical parameters collected during this study did not reveal any levels that were indicative of stream degradation. It is important to note that the sampling for this study took place in September, well after crop fertilizer application had taken place in the spring. Rain events during spring and early summer normally result in runoff and a corresponding increase in concentrations of contaminants in the stream. Sampling during the fertilization season may have shown more of a nutrient loading and offered further explanation for the abundance of algae.

## Quality Assurance/ Quality Control

### Data Quality

IDEM chemists from the Toxicology and Chemistry Section, Assessment Branch, OWQ reviewed laboratory data reports from samples for the *Unnamed Tributary of Rowan Ditch (Jasper County) Low Dissolved Oxygen and Impaired Biotic Community Source Identification Study* for compliance to the Surface Water QAPP requirements for Quality Assurance / Quality Control (QA/QC).

### Precision

The in-lab quality assurance for data in this report for analytical precision was based on laboratory duplicates, matrix spike duplicates, and Relative Percent Difference (RPD). Most RPDs for all the parameters were within control limits (+/- 20%), but some high RPDs were

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<sup>1</sup> Unpublished data gathered from the Assessment Branch data base.

noted with some data sets for Sulfate and Total Phosphorus. Sulfate results were flagged as estimated, Total Phosphorus results were rejected.

### **Accuracy**

The in-lab analytical accuracy was based on matrix spikes, matrix spike duplicates, quality control samples, and on-going performance recovery samples. Laboratory QC samples were within control limits for the parameter.

### **Holding Times**

Laboratory holding times for all the parameters except Hardness were within acceptable limits per Table 2 in 40 CFR part 136. Hardness exceeded acceptable holding times and the results were rejected.

### **Blanks**

Significant results, greater than the MRL, for a parameter indicates contamination from the field sampling process (field blanks) or laboratory sample preparation (field blanks or lab blanks). Blank contamination of Total Kjeldahl Nitrogen (TKN) was noted for some data sets. Affected results were flagged either as estimated or rejected depending upon the level of contamination.

Of the 84 results gathered for this project, 15.5% (13) were rejected and 3.6% (3) were qualified as estimated. As per the Surface Water QAPP, the non-rejected data was qualified at Data Quality Assessment Level 3 and acceptable for use in IDEM decision making processes. Rejected data was not used for assessment purposes. Details of the Quality Assurance Analysis are included in Attachment I.

## **Summary and Conclusions**

Stream conditions present in the Tributary of Rowan Ditch are the direct result of agricultural activity that lead to impaired water quality and an impaired biotic community. This agricultural ditch lies amidst intensive row crop activity and is particularly susceptible to nutrient runoff, especially from the north bank of the stream channel where the riparian buffer is minimal. This condition along with a small culvert dam downstream of the study sampling site are combining to create an ideal environment for algae and duckweed growth in what is essentially a small reservoir. With no way for the stream to cleanse itself through the normal flushing dynamics of gradient and re-aeration, anoxic conditions are established. Warm weather conditions result in initial algae proliferation followed by 100% duckweed cover that effectively shut down photosynthetic activity and cause subsequent algal die off. These factors compound oxygen depletion and result in severely depressed D.O. levels. Additionally, the decaying vegetative matter causes an extremely mucky sediment and in all probability significant sediment oxygen demand (SOD). These conditions provide a reasonable explanation of the very poor IBI score and why 79% of the collected individuals were tolerant species. Considering the extremely low D.O. levels found during the probabilistic sampling event and the present study, it appears incredible that the fish community assessment collected 29 individuals at this stream

For 305(b) assessment and reporting purposes causes and sources were determined and are listed in Tables 6 and 7 (IDEM 2002b).

**Table 6 Causes of Impairment for 305(b) Assessment and Reporting Purposes**

<b>Cause Code</b>	<b>Cause Name</b>	<b>Definition</b>
900	Nutrients	Inorganic nutrients are driving physical/chemical stream imbalance
1100	Siltation	Imbeddedness and smothering of substrate
1200	Organic enrichment/Low D.O.	Major category included with organic enrichment and low dissolve oxygen
1220	Low D.O.	Stream dissolved oxygen results do not meet criteria
1500	Flow Alteration	Addition or subtraction of discharge, change in velocity
1600	Other habitat alterations	Response to land use practice such as dredging or channelization
2210	Algal Growth/Chlorophyll a	Overgrowth of algae observed

**Table 7 Sources of Impairment for 305(b) Assessment and Reporting Purposes**

<b>Source Code</b>	<b>Source Name</b>	<b>Definition</b>
1050	Crop-related Sources	Land use is row crops
7100	Channelization	Straightening channel
7350	Impoundment	Not used
7600	Removal of Riparian Vegetation	Bushes, trees, removed; row crops to bank edge

## References

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## ATTACHMENT I

### Quality Assurance of Analytical Data for Water Samples from the Source Identification

Sampling Dates: 9/20/2000

Environmental Toxicology and Chemistry Section, AB/OWM  
**QA/QC Review Report: IDEM/100/29/477/096/2000**

IDEM Sample Set # 00WQW222

#### Sample Identification and Sampling Locations

1	AA02109	275912	Normal	9/20/00	UMI050-0012	Thompson Ditch	CR 700 S	Newton
2	AA02110	275913	Field Blank	9/20/00	BLANK		Dummy Site for Blanks	
3	AA02111	275914	Normal	9/20/00	UMI050-0007	Thompson Ditch	CR 800 S	Newton
4	AA02114	275915	Normal	9/20/00	UMI020-0016	Tributary of Rowan Ditch	CR 1000 W	Jasper
5	AA02115	275916	Normal	9/20/00	UMI050-0001	Montgomery Ditch	CR 450 W	Newton
6	AA02116	275917	MS/MSD	9/20/00	UMI050-0013	Thompson Ditch	CR 350 W	Newton
7	AA02117	275918	Duplicate	9/20/00	UMI050-0007	Thompson Ditch	CR 800 S	Newton

#### Testing Laboratory:

Test America Incorporated (TA)  
Indianapolis Division  
6964 Hillisdale Ct.  
Indianapolis, IN 46250

Sample Receipt Date to TA: 9/21/2000  
TA Job Number (s): 00.05041

Contact Person:

Ž Ken Busch

Ž Telephone: 317-842-4261

Date Report Prepared: 10/25/2000

Date Report Received: 11/8/2000

**Chain of Custody:** A check mark (U) below indicates information about each item is complete and acceptable.

Ž Sampler Signature U

Ž Collection Date(s) U

Ž Preservatives U

Ž Custodian Signature U

Ž Receiving Time(s) U

Ž Containers U

Ž Collection Time(s) U

Ž Receiving Date(s) U

## General Chemistries

Test Methods and Reporting Limits (mg/L unless otherwise noted)

<u>PARAMETERS:</u>	<u>TEST METHODS</u>	<u>IDEM REPORTING LIMITS</u>	<u>TA REPORTING LIMITS</u>
Alkalinity	310.1	10	10
Chloride	325.2	1.0	1.0
Chemical Oxygen Demand (COD)	410.4	3.0	5.0
Hardness (as CaCO <sub>3</sub> )	130.1	1.0	1.0
Nitrogen, Ammonia	350.1	0.01	0.10
Nitrogen, Total Kjeldahl (TKN)	351.2	0.05	0.10
Nitrogen, Nitrate+Nitrite	353.2	0.01	0.01
Phosphorus, Total	365.2	0.01	0.03
Solids, Dissolved (TDS)	160.1	10	10
Solids, Suspended (TSS)	160.2	4.0	4.0
Solids, Total (TS)	160.3	1.0	7.0
Sulfate	375.2	1.0	5.0
Total Organic Carbon (TOC)	415.1	1.0	1.0

**Quality Control (QC) Checks and Compliance:** A check mark (U) below indicates information about each QC criterion is complete and acceptable.

- Ž Summary Data Package U
- Ž Prep Dates U
- Ž Analysis Dates U
- Ž Holding Times U
- Ž Approved Analytical Methods U
- Ž Approved Detection Limits U
- Ž Method, Field, and Trip Blanks (< CRQL) U
- Ž Field and Method Duplicates (RPD ≤ 20%) U
- Ž Matrix Spikes and Matrix Spike Duplicates (± 20%; RPD ≤ 20%) U
- Ž Instrument Calibrations (Correlation Coefficient ≥ 0.995) U
- Ž Laboratory Control Standards (± 20%) U
- Ž Initial and Continuing Calibration Verification Standards (± 10%) U

**Comments:** See Below

<b><u>IDEM ID</u></b>	<b><u>Parameter(s)</u></b>	<b><u>Data Flag(s)</u></b>	<b><u>Action</u></b>
AA02109, AA02111, AA02115, AA02117	Nitrogen, Total Kjeldahl (TKN) ①	<b>B R</b>	<b>Rejected</b>
AA02116	Nitrogen, Total Kjeldahl (TKN) ②	<b>B J</b>	<b>Estimated</b>
AA02114	Nitrogen, Total Kjeldahl (TKN) ③	<b>B Q</b>	<b>Accepted</b>
AA02111, AA02117	Sulfate ④	<b>D J</b>	<b>Estimated</b>
AA02111, AA02117	Phosphorus, Total ⑤	<b>D R</b>	<b>Rejected</b>
AA02109, AA02110, AA02111, AA02114, AA02115, AA02116, AA02117	Hardness (as CaCO <sub>3</sub> ) ⑥	<b>H Q R</b>	<b>Rejected</b>

- ① This parameter was found in field blank at .21 mg/L. All of the samples that are above the reporting limit and below 1.05 mg/L will be rejected.
- ② This parameter was found in field blank at .21 mg/L. All of the samples that between 1.06 mg/L and 2.1 mg/L will be estimated
- ③ This parameter was found in field blank at .21 mg/L. All of the samples that are below the reporting limit and above 2.11 mg/L will be accepted.
- ④ The Relative Present Difference (RPD) between the field duplicates was above acceptable control range, of 20%. The RPD was 31% and will be considered estimated.
- ⑤ The Relative Present Difference (RPD) between the field duplicates was above acceptable control range, of 20%. The RPD was 43.9% and will be considered rejected.
- ⑥ Test America indicated that the samples were improperly preserved when delivered to the lab. We have allowed the Indiana State Department of Health a holding time of 14 days on an unpreserved Hardness sample; therefore the analysis for this set of samples was preformed out of the holding time of 14 days. The analysis was preformed after the 21<sup>st</sup> day and will be rejected.

### **Data Qualifiers and Flags**

- R: Rejected  
J: Estimated.  
Q: One or more of the QC checks or criteria was out of control.  
H: The analysis for this parameter was performed out of the holding time. The results will be estimated or rejected on the basis listed below:  
    1) If the analysis was performed between the holding time and 1½ times the holding time the result will be estimated.  
    2) If the analysis was performed outside the 1½ times the holding time window the result will be rejected.  
D: The Relative Present Difference (RPD) for this parameter was above the acceptable control limits. The parameter will be considered estimated or rejected on the basis listed below:  
    1) If the RPD is between the established control limits and two times the established control limits then the sample will be estimated.

- 2) If the RPD is twice the established control limits then the sample will be rejected.
- B: This parameter was found in field or lab blank. Whether the result is accepted, estimated, or rejected will be based upon the level of contamination listed below.
- 1) If the result of the sample is greater than the reporting limit but less than five times the blank contamination the result will be rejected.
  - 2) If the result of the sample is between five and ten times the blank contamination the result will be estimated
  - 3) If the result of the sample is less than the reporting limit or greater than ten times the blank contamination the result will be accepted.
- U: The result of the parameter is above the Method Detection Limit (MDL) but below the reporting limit and will be estimated.

**Data Quality Assessments (DQAs):** A check mark (U) below indicates the DQA Level to which the analytical data qualifies.

**Level 1 9**      **Screening data:** The results are usually generated onsite and have no QC checks. Analytical results, which have no QC checks or no precision or accuracy information or no detection limit calculations, but just numbers, are included in this category. Primarily, onsite data are used for presurveys and for preliminary rapid assessment.

**Level 2 9**      **Field analysis data:** Data is recorded in the field or laboratory on calibrated or standardized equipment. Field duplicates are measured on a regular periodic basis. Calculations may be done in the field or later at the office. Analytical results, which have limited QC checks, are included in this category. Detection limits and ranges have been set for each analysis. The QC checks information for field or laboratory results is useable for estimating precision, accuracy, and completeness for the project. Data from this category is used independently for rapid assessment and preliminary decisions.

**Level 3 [U]**      **Laboratory analytical data:** Analytical results include QC check samples for each batch of samples from which precision, accuracy, and completeness can be determined. Detection limits have been determined using 40 CFR Part 136 Appendix B, Revision 1.11. Raw data, chromatograms, spectrograms, and bench sheets are not included as part of the analytical report, but are maintained by the Contract Laboratory for easy retrieval and review. Data can be elevated from level 3 to level 4 by the inclusion of this information in the report. In addition, level 4 QC data must be reported using CLP forms or CLP format. Data falling under this category is considered as complete and is used for regulatory decisions.

**Level 4 9**      **Enforcement data:** Analytical results mostly meet the USEPA required Contract Laboratory Program (CLP) data analysis, contract required quantification limits (CRQL), and validation procedures. QC data is reported on CLP forms or CLP format. Raw data, chromatograms, spectrograms, and bench sheets are included as part of the analytical report. Additionally, all reporting information required in the IDEM/BAA and in the Surface Water QAPP Table 11-1 are included. Data is legally quantitative in value, and is used for regulatory decisions.

**Compliance Statement:**

The laboratory results for a Data package from **7 water** samples received from Test America (TA) were reviewed for compliance with IDEM BAA 97-44, dated 4/18/97 and OWM QAPP (Rev. 2, June 1999) for Indiana Surface Water Programs.

**Summary and Conclusions:**

1. Data Quality Assessment Level: 3
2. Level of Completeness: 100%

The data for the **7 water** samples from data package **00WQW222** has been assigned to Data Quality Assessment (DQA) Level 3 of QAPP for Indiana Surface Water Programs. The analytical results for **7 water** samples appear acceptable and could be used for OWM decision making.

Reviewed by:

Signature: Christopher Haynes Title: Chemist Date: November 27, 2000  
Original Signed Copy on File

Approved by:

Signature: Dr. Syed GhiasUddin Title: QA/Coordinator Date: \_\_\_\_\_  
Original Signed Copy on File

Distribution List:

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Christopher Haynes  
Dr. GhiasUddin  
(File copy)



# ATTACHMENT II

## Indiana Department of Environmental Management

### Office of Water Quality/ Assessment Branch/ Biological Studies Section

#### Fish Community Assessments

#### Site Information

SubBasin: Iroquois 14 digit HUC: 07120002020010 LSite: UMI020-0016  
 Site: Trib of Rowan Ditch Location: CR 1000 W County: Jasper  
 Latitude: 41 3 8.8833 Longitude: -87 14 28.881 IASNatRegion: 3B Topo: B-50 Segment: 15  
 Ecoregion: Central Corn Belt Plains DrainageArea (sq.miles): 0.75 Gradient (ft/mile): 4.5

#### Sample Information

SampleNumber: DA13621 EventID: 99022 SampleMediumCollected: Water + FishComm  
 SampleDate: 7/13/99 9:37: SurveyCrewChief: ARB SampleTime: 9:37:00 AM HydroLabNumber: BS3  
 WaterFlowType: WaterAppearance: SkyConditions: AirTemperature:  
 WindDirection: WindStrength:  
 DissolvedO2 (mg/l): 0.25 pH: 7.16 WaterTemp (°C): 18 SpecificConductivity (µS/cm): 475 Turbidity (NTU): 0  
 SpecialNotes:

ElectrofishingEquipment: Scanco Voltage: 300 Avg.StreamWidth (m): 7.3 DistanceFished (m): 105  
 SecondsFished: 1289 WaterDepthAvg (m): 1 WaterDepthMax (m): 1.3 TimeAtSite: 3:00  
 BridgeInReach: ☐ ReachRepresentative: ☒ WhyReachNotRepresentative:  
 SpecialComments: 100% stream surface covered with duckweed, difficult to sample, blockage at culvert has created impoundment.

#### Habitat Information

TotalScore (max100): 42 SubstrateScore (max20): 3 InstreamCoverScore (max20): 16 ChannelMorphologyScore (max20): 4  
 RiparianZoneBankErosionScore (max10): 5 Pool/GlideQualityScore (max12): 8 Riffle/RunScoreQuality (max8): 0  
 GradientScore(max10): 6 %Pool: 0 %Riffle: 0 %Run: 100 %Glide: 0 CanopyCoverPctOpen:  
 SubjectiveRating: 2 AestheticRating: 2 NOTES:

#### Fish Community Index of Biotic Integrity (IBI) Information

	Actual Observation	Metric Score		Actual Observation	Metric Score
SpeciesCount:	6	5	SensitiveSpeciesCount:	0	1
Darter/Madtom/SculpinSpeciesCount:	0	1	%TolerantIndividuals:	79.3	1
DarterSpeciesCount:	0		%OmnivoreIndividuals:	13.8	3
%LargeRiverIndividuals:			%InsectivoreIndividuals:	69.0	5
%HeadwaterIndividuals:	0.0	1	%PioneerIndividuals:	20.7	5
SunfishSpeciesCount:	1		%CarnivoreIndividuals:	17.2	
CentrarchidaeSpeciesCount:			Total #of Individuals(CPUE):	29	1
MinnowSpeciesCount:	1	3	CPUElessGizzardShads:		
SuckerSpeciesCount:	1		%SimpleLithophilicInd.:	0.0	1
RoundBodySuckerSpeciesCount:			%Ind.withDeformities,	6.9	1
SalmonidaeSpeciesCount:			ErodedFins,Lesions,Tumors:		
Metrics are dependent on Ecoregion and Drainage Area. Metrics can score a 1, 3, or 5 depending on calibration.			TotalIBIScore (min 6=no fish):	28	max=60

**Indiana Department of Environmental Management**  
**Office of Water Quality/ Assessment Branch/ Biological Studies Section**  
**Fish Community Assessments**

**SampleNumber:** DA13621 **EventID:** 99022 **LSite:** UM1020-0016 **County:** Jasper  
**StreamName:** Trib of Rowan Ditch **LocationDescription:** CR 1000 W

Common Name	Individual Fish Count	Deformities	Eroded Fins	Lesions	Tumors	Multiple Anomalies
Black Bullhead	2	0	0	1	0	0
Central Mudminnow	4	0	0	0	0	0
Golden Shiner	12	1	0	0	0	0
Grass Pickerel	5	0	0	0	0	0
Green Sunfish	5	0	0	0	0	0
Lake Chubsucker	1	0	0	0	0	0